

**IN THE DRAWINGS:**

Please substitute the attached new figure 3, marked as a "REPLACEMENT SHEET," for the previous Figure 3.

### REMARKS

This is a response to the Office Action dated May 9, 2006. Claims 1-31 are pending in the application. In the Office Action, the Examiner objected to Figure 3. The Examiner further rejected claims 24-27 under 35 U.S.C. § 112, second paragraph and further under 35 U.S.C. § 101. In addition, the Examiner rejected claims 1-4, 11-12, 14, and 30-31 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,560,362 ("Sliwa"). Claims 5-9, 11-12, 14-15, 17-19, 21-22 and 24-29 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Sliwa in view of U.S. Pat. No. 5,961,465 ("Kelly") alone or further in view of Japanese Patent No. JP 04336052 ("Matsumoto") or U.S. Patent No. 6,445,580 ("Cohen"). Claim 10 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Sliwa in view of Kelly, Matsumoto and Cohen. Claims 13, 20 and 23 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Sliwa in view of Kelly, alone or further in view of Matsumoto or Cohen, and further in view of U.S. Pat. No. 3,573,557 ("Riggs"). Claim 16 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Sliwa in view of U.S. Pat. No. 6,645,145 ("Dreschel").

The rejections from the Office Action of May 9, 2006 are discussed below in connection with the various claims. No new matter has been added. Reconsideration of the application is respectfully requested in light of the following remarks.

#### I. DRAWING REJECTIONS

The Examiner objected to Figure 3 due to a typographic error. With this response, a substitute Figure 3 has been provided which corrects the typographic error noted by the Examiner.

Accordingly, Applicants request that the Examiner withdraw this objection.

## **II. REJECTIONS UNDER 35 U.S.C. § 112, second paragraph and 35 U.S.C. § 101**

The Examiner rejected claims 24-27 under 35 U.S.C. § 112, second paragraph as being indefinite, and further under 35 U.S.C. § 101, as not being confined to a single statutory class.

With this response, claim 24 has been amended to correct a typographic error in the claim dependency. This amendment was made for clarity and not for reasons relating to patentability. Applicants submit that claims 24-27, as amended, are definite and directed to a single statutory class.

Accordingly, Applicants request that the Examiner withdraw these rejections.

## **III. REJECTIONS UNDER 35 U.S.C. § 102(b)**

### **A. Independent Claims 1 and 30**

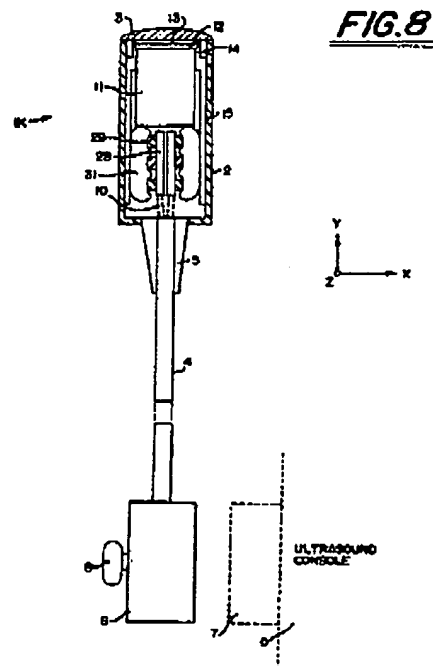
Independent claims 1 and 30 were rejected pursuant to 35 U.S.C. § 102(b) as being anticipated by Sliwa. Applicants submit that claims 1 and 30 are not anticipated by Sliwa as Sliwa fails to disclose all of the elements of Applicants' claims.

In particular, Sliwa relates to an "... ultrasound transducer assembly having a housing, a transducer array mounted in the housing, and active cooling mechanism positioned adjacent to the transducer array for actively removing heat generated by the array by transport of heat energy from the affected site. The active cooling mechanism may comprise a heat exchanger including a closed loop circulating coolant system circulating coolant, or a single-pass flowed coolant, passing through the heat exchanger, a heat pipe, a thermoelectric cooler, an evaporative/condenser system, and/or a phase change material. One or more heat exchangers may be used having gas or liquid coolants flowing therethrough. The heat exchangers and coolant pumps may be located in various components of the transducer assembly, including the array housing, the connector assemblies or the ultrasound console." *See Sliwa, Abstract.*

Further, Sliwa discloses, with respect to Figure 8, reproduced below:

*... two printed circuit boards or substrates 28, each supporting electronic components 29, are mounted back-to-back in the case 2 of transducer 1. The boards 28 and components 29 may, for example, consist of multiplexing electronics, amplifiers, matching electronics, computational and/or memory*

electronics or any other electronic or heat-producing subsystem used in the operation of transducer 1. Liquid-filled bags 31 are deformably squeezed between each board 28 and component 29 subsystem, and thermal member 15. Such fluid-filled and hermetically sealed deformable bags 31 may be obtained from 3M Industrial Chemical Products Division (Building 223-6S-04, 3M Center, St. Paul, Minn. 55144-1000). It will be noted that the surface of each board subsystem has an irregular surface shape due to components 29 mounted upon them and that bags 31 conform nicely to said irregular surfaces thus insuring maximal thermal contact. Bags 31 are typically metalized polymeric bags containing 3M Fluorinert.TM. thermally-conductive liquids. Thus, heat may freely flow out of the components 29 directly into contacting and juxtaposed bag 31, and then from bags 31 into plates 15. The great advantage of bags 31 is that one may easily disassemble board 28 and components 29 from the transducer 1K at any point in time to service the transducer without having to deal with the removal of the alternative and messy thermally-conductive potting compounds. (emphasis added). *See Sliwa, Col. 21, lines 15-46.*



Sliwa, Figure 8

Sliwa fails to disclose "...an electronics assembly located in ... [the transducer] housing and coupled with said transducer and characterized by an interior portion and an

exterior portion, said electronics assembly including: at least one electronics sub-assembly having at least one discrete electrical component affixed thereto and located in said interior portion; and a first thermal conductor thermally coupled with said at least one discrete electrical component and operable to remove heat generated by said at least one discrete electrical component and move said heat from said interior portion to said exterior portion[.]” as claimed in Claim 1. Further, Sliwa fails to disclose “... an electronics assembly located in ... [a] housing and characterized by an interior portion and an exterior portion, said electronics assembly including at least one electronics sub-assembly having at least one discrete electrical component affixed thereto and located in said interior portion...” where “said ultrasound transducer...” further includes “...means for removing heat generated by said at least one discrete electrical component from said interior portion to said exterior portion using a first thermal conductor means thermally coupled with said at least one electrical component.” as claimed in claim 30.

In contrast, as shown in Figure 8 of Sliwa, Sliwa discloses an electronics assembly 28 located in the housing 2 having discrete components 29 located on the exterior of the electronics assembly 28, i.e. the exterior-facing side of the circuit boards. This is necessary so that the discrete components 29 are accessible to the heat conducting liquid filled bags 31. As opposed to Applicants’ claimed invention, the arrangement disclosed by Sliwa is limiting because the discrete components 29 must be mounted on the exterior of the assembly 28 or they cannot be cooled. Applicants’ claimed invention permits the discrete components to be located in the interior of the electronics assembly, allowing for more flexibility in placement and design.

Accordingly, Applicants submit the claims 1 and 30 are not Anticipated by Sliwa and the Examiner is requested to withdraw the rejection of these claims

**B. Dependent Claims 2-4, 11-12, 14 and 31**

Dependent claims 2-4, 11-12, 14 and 31 were also rejected as being anticipated by Sliwa. The dependent claims should be allowed for the same reasons as set out above for the independent claims. Accordingly, the Examiner is requested to withdraw the rejection of these claims.

#### **IV. REJECTIONS UNDER 35 U.S.C. § 103(a)**

##### **A. Independent Claim 17**

Independent claim 17 was rejected pursuant to 35 U.S.C. § 103(a) as being unpatentable over Sliwa in view of Kelly, alone, or further in view of Matsumoto or Cohen. Applicants submit that claim 17 is patentable over Sliwa in view of Kelly, alone, or further in view of Matsumoto as these references, alone or in combination, fail to disclose all of the elements of Applicants' claim.

Sliwa is discussed above. Kelly relates to "...an ultrasound transducer operable to generate and receive ultrasonic energy, a communication cable, integrated circuits for processing signals received from said ultrasound transducer and flexible circuits for connecting the communication cable to the integrated circuit, and for further connecting the integrated circuits to the ultrasound transducer. A housing contains the ultrasound transducer, the integrated circuits and the flexible circuits. A heat transfer structure is positioned within the housing and is in contact with the integrated circuit. A heat conductor resides in contact with the heat transfer structure and conducts heat generated by the integrated circuits to a heat sink." *See* Kelly, Abstract.

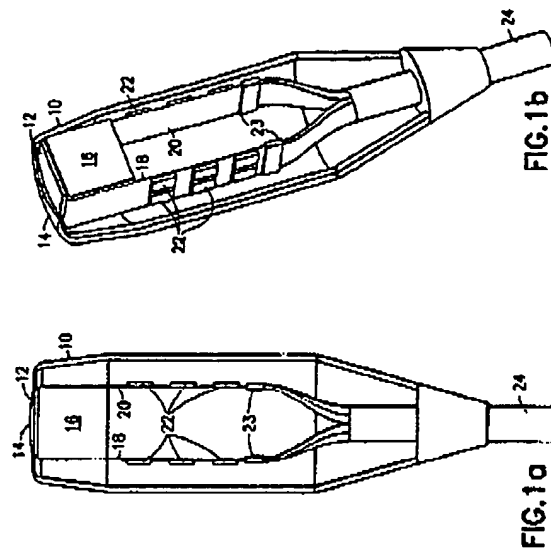
Matsumoto relates to suppression of "... heat generation of an ultrasonic probe and to prevent the occurrence of such danger as a low temperature burn by mounting a Peltier effect element on an electrode arranged on the organism probe side of a piezoelectric element in an ultrasonic probe and providing a heat sink mechanism connected thereto." *See* Matsumoto, Abstract (translated).

Cohen relates to "[a] cooling apparatus, method and article of manufacture ... which provide[s] for selectively providing power to an attached heat-dissipating apparatus having a cooling probe in thermal contact with a cooling unit, to remove heat generated by a heat-generating source within the computer to an external environment outside of the computer. Power may be conserved, portable battery life extended, higher-speed processors utilized, and overall dimensional characteristics of a personal computer may be slimmed and reduced by utilizing the apparatus with a personal computer. Heat energy is transferred across a thermal connection interface from the heat-generating source of the personal computer to a

collection face of the apparatus, and thereafter collected heat energy is dissipated in relation to the available power of the power source and/or the planned operating speed of the processor." See Cohen, Abstract.

Sliwa, Kelly, Matsumoto and Cohen all fail to disclose "A method of cooling an ultrasound transducer, said ultrasound transducer comprising ... an electronics assembly located in [a] housing and characterized by an interior portion and an exterior portion, said electronics assembly including at least one electronics sub-assembly having at least one discrete electrical component affixed thereto and located in said interior portion, said method comprising...removing said heat from said interior portion to said exterior portion using a first thermal conductor thermally coupled with said at least one electrical component[.]" as claimed.

Sliwa was discussed above. Kelly discloses an electronics assembly having discrete components only mounted on the exterior of the assembly. See Kelly, Figures 1a and 1b (reproduced below) which show "an ultrasound transducer housing 10..., prior to inclusion of active cooling apparatus within its structure. Transducer housing 10 includes an acoustic crystal 12, an acoustic lens 14 and an acoustic backing 16. Connected to either side of acoustic crystal 12 are a pair of flexible circuit carriers 18 and 20, on which a plurality of integrated circuits 22 are mounted. Each of flexible circuit carriers 18 and 20 is electrically connected via a connector 23, to a cable 24 which exits transducer housing 10 at one extremity thereof. A perspective view of transducer housing 10, and its included components, is shown in FIG. 1b" See Kelly, Col. 2, lines 34-45.



Kelly, Figures 1a and 1b

As can be seen in the figures of Kelly, Kelly only described discrete components mounted on the exterior of the electronics assembly, not the interior as claimed by Applicants.

Matsumoto and Cohen also fail to disclose this limitation of Applicants' claim. Both Matsumoto and Cohen relate to cooling particular devices but fail to disclose an electronics assembly having an interior and exterior where the discrete components are mounted on the interior.

For at least these reasons, claim 17 is patentable over Sliwa in view of Kelly, alone or further in view of Matsumoto or Cohen. Accordingly, Applicant requests that the Examiner withdraw this rejection of claim 17.

Dependent claims 5, 6, 15-17, 22, 23, 32-34 and 37-38 were also rejected pursuant to 35 U.S.C. § 103(a) as being unpatentable over Slayton in view of Amos. Dependent claims 5, 6, 15-17, 22, 23, 32-34 and 37-38 should be allowed for the reasons set out above for the independent claims. Applicants therefore request that the Examiner withdraw this rejection of these claims.



**B. Dependent Claims 5-12, 14-15, 18-19, 21-22, and 24-29**

Dependent claims 5-12, 14-15, 18-19, 21-22, and 24-29 were also rejected pursuant to 35 U.S.C. § 103(a) as being unpatentable over Sliwa in view of Kelly, alone or further in view of Matsumoto or Cohen. Dependent claims 5-12, 14-15, 18-19, 21-22, and 24-29 should be allowed for the reasons set out above for the independent claims. Applicants therefore request that the Examiner withdraw this rejection of these claims.

**C. Dependent Claims 13, 20 and 23**

Dependent claims 13, 20 and 23 were also rejected pursuant to 35 U.S.C. § 103(a) as being unpatentable over Sliwa in view of Kelly, alone or further in view of Matsumoto or Cohen, and further in view of Riggs. Dependent claims 13-20 should be allowed for the reasons set out above for the independent claims. Applicants therefore request that the Examiner withdraw this rejection of these claims.

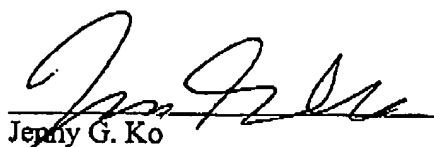
**D. Dependent Claim 16**

Dependent claim 16 was rejected pursuant to 35 U.S.C. § 103(a) as being unpatentable over Sliwa in view of Dreschel. Dependent claim 16 should be allowed for the reasons set out above for the independent claims. Applicants therefore request that the Examiner withdraw this rejection of these claims.

**CONCLUSION**

Each of the rejections in the Final Office Action dated May 9, 2006 has been addressed and no new matter has been added. Applicants submit that all of the pending claims are in condition for allowance and notice to this effect is respectfully requested. The Examiner is invited to call the undersigned if it would expedite the prosecution of this application.

Respectfully submitted,



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7/12/06

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